

[0062]

*What is claimed is:*

CLAIMS

1. A method for manufacturing a multi-layer film for use in vacuum packaging applications, said multi-layer film having a pattern that operates to form channels suitable for evacuation of gas when said multi-layer film is used in the creation of a vacuum packaging bag, said method comprising the acts of:  
 heat-extruding a first material onto a spinning cooling roll;  
 heat-extruding a second material onto said spinning cooling roll such that said first and second extruded materials bond and form first and second layers of said multi-layer film during a cooling of said first and second extruded materials; and  
 applying a pattern to said first and second layers in conjunction with said extrusion and said cooling of said first and second extruded materials such that said pattern is defined during said cooling of said first and second materials, said pattern operable to form channels suitable for evacuation of gas from said vacuum packaging bag made of said multi-layer film.
2. A method for manufacturing a multi-layer film as recited in claim 1, wherein said first material is a heat-sealable resin.
3. A method for manufacturing a multi-layer film as recited in claim 2, wherein said second material is a gas impermeable material.
4. A method for manufacturing a multi-layer film as recited in claim 3, further including the act of heat-extruding a first bonding material in between said first and second material, said first bonding material forming a first bonding layer between said first and second layers.

5        5.        A method for manufacturing a multi-layer film as recited in claim 4, further comprising the act of heat-extruding a second bonding material and a structural material to form a second bonding layer and a structural layer, said second bonding layer bonding said structural layer to said second layer, said structural layer intended to provide additional strength to said multi-layer film.

6.        A method for manufacturing a multi-layer film as recited in claim 5, wherein said act of applying a pattern operates to apply said pattern to all five layers of said multi-layer film.

10        7.        A method for manufacturing a multi-layer film as recited in claim 1, wherein the act of applying a pattern to said first and second layers is accomplished by providing said pattern on the circumferential surface of said cooling roll.

15        8.        A method for manufacturing a multi-layer film as recited in claim 7, further including the act of positioning a laminating roll to apply pressure to the extruded materials in order to apply said pattern formed on the circumferential surface of said cooling roll onto said multi-layer film.

20        9.        A method for manufacturing a multi-layer film as recited in claim 8 further including the act of controlling a temperature of said cooling roll in order to properly effectuate cooling and formation of said first and second layers.

25        10.       A method for manufacturing a multi-layer film as recited in claim 1, wherein the act of applying a pattern to said extruded layers is accomplished by extruding said materials over a patterned cooling plank which in turn directs said extruded materials to flow over said cooling roll.

30        11.       A method for manufacturing a multi-layer film as recited in claim 2, further including the act of controlling a temperature of said cooling plank to properly effectuate cooling and formation of said first and second layers.

12. A method for manufacturing a multi-layer film as recited in claim 1, wherein said pattern is a zigzag pattern.

13. A method for manufacturing a multi-layer film as recited in claim 1, wherein said channels formed by said pattern have a varying width thereby retarding fluid flow therethrough.

14. A method for manufacturing a vacuum packaging bag, said method comprising:

a) forming a first patterned film sheet including:

i) heat-extruding a first material onto a spinning cooling roll;

10 ii) heat-extruding a second material onto said spinning cooling roll such that said first and second extruded materials bond and form first and second layers of said first patterned film during a cooling of said first and second extruded materials; and

15 iii) applying a pattern to said first and second layers in conjunction with said extrusion and said cooling of said first and second extruded materials such that said pattern is defined during said cooling of said first and second materials, said pattern operable to form channels suitable for evacuation of gas from said vacuum packaging bag made of said first patterned film sheet;

b) bonding a second film sheet onto said first film sheet via sealing opposing sides to form a pouch with two open ends;

20 c) sizing said pouch to a desired size; and

d) bonding a one of said open ends to form a vacuum packaging bag.

15. A method of manufacturing a vacuum packaging bag as recited in claim 14, wherein said pattern is a zigzag pattern.

25 16. A method of manufacturing a vacuum packaging bag as recited in claim 14, wherein said second film sheet is patterned.

30 17. A method of manufacturing a vacuum packaging bag as recited in claim 14, wherein said bonding includes applying heat along said opposing sides.

18. A method of manufacturing a vacuum packaging bag as recited in claim 14, wherein said bonding includes applying pressure along said opposing sides.

19. A method for manufacturing a roll of vacuum packaging bag material, said method  
5 comprising:

a) forming a first patterned film sheet including:

i) heat-extruding a first material onto a spinning cooling roll;

ii) heat-extruding a second material onto said spinning cooling roll such that  
10 said first and second extruded materials bond and form first and second layers of said first patterned film during a cooling of said first and second extruded materials; and

iii) applying a pattern to said first and second layers in conjunction with said  
15 extrusion and said cooling of said first and second extruded materials such that said pattern is defined during said cooling of said first and second materials, said pattern operable to form channels suitable for evacuation of gas from said vacuum packaging bag made of said first patterned film sheet;

b) bonding a second film sheet onto said first film sheet via sealing opposing sides to form  
a pouch with two open ends;

c) forming said pouch into said roll of vacuum packaging material.

20 20. A method for manufacturing a roll as recited in claim 19, wherein said pattern is a zigzag pattern.

21. An apparatus for manufacturing a multi-layer film for use in vacuum packaging  
25 applications, said multi-layer film having a pattern that operates to form channels suitable for evacuation of gas when said multi-layer film is used in the creation of a vacuum packaging bag, said apparatus comprising:

a multi-layer extruder for extruding a first material and a second material;

a cooling roll positioned with respect to said extruder such that said extruder applies said  
30 first and second materials onto a circumferential surface of said cooling roll such that said first and second extruded materials bond and form first and second layers of said multi-layer film during a cooling of said first and second extruded materials; and

a pattern forming mechanism arranged to pattern said first and second layers during said extrusion and cooling of said first and second materials.

22. An apparatus as recited in claim 21, wherein said extruder is a melt-extrusion  
5 extruder.

23. An apparatus as recited in claim 21, wherein said extruder further includes a nozzle arranged to apply said first and second materials.

10 24. An apparatus as recited in claim 21, wherein said first material is a heat-sealable resin and said apparatus further includes a source of said heat-sealable resin coupled to said multi-layer extruder.

15 25. An apparatus as recited in claim 21, wherein said second material is a gas impermeable material and said apparatus further includes a source of said gas impermeable material coupled to said multi-layer extruder.

20 26. An apparatus as recited in claim 21, wherein said pattern forming mechanism includes a patterned formed on said circumferential surface of said cooling roll.

27. An apparatus as recited in claim 26, wherein said pattern on said circumferential surface of said cooling roll is an uneven pattern.

25 28. An apparatus as recited in claim 26, wherein said pattern on said circumferential surface of said cooling roll is a wave pattern.

29. An apparatus as recited in claim 26, wherein said pattern on said circumferential surface of said cooling roll is a striped pattern.

30 30 An apparatus as recited in claim 26, wherein said pattern is a zigzag pattern.

31. An apparatus as recited in claim 21, wherein said pattern forming mechanism includes a patterned cooling ramp disposed between said multi-layer extruder and said cooling roll.

5 32. An apparatus as recited in claim 21, wherein said pattern forming mechanism includes an airknife operable to shape said first and second materials subsequent to extrusion such that said first and second materials form said patterned first and second layers on said cooling roll.

10 33. An apparatus as recited in claim 21, said apparatus further comprising a temperature controller for controlling a temperature of said cooling roll in order to properly effectuate cooling and formation of said first and second layers.

34. An apparatus as recited in claim 21 further comprising a laminating roll arranged to assist in holding said first material onto said cooling roll.

15 35. An apparatus as recited in claim 34, wherein said laminating roll includes rubber.

36. An apparatus as recited in claim 34, wherein a cooling roll diameter is about 1.5 to 3 times larger than a laminating roll diameter.

20 37. An apparatus as recited in claim 34 wherein said extruder, cooling roll, and laminating roll are arranged to accept an outer layer in conjunction with said extruded first material, such that said inner layer and said outer layer are laminated in between the cooling roll and the laminating roll to form said multi-layer film.

25 38. An apparatus for manufacturing a multi-layer film for use in vacuum packaging applications, said multi-layer film including an inner layer having a plurality of grooves which operate to form channels suitable for evacuation of gas when said multi-layer film is used in the creation of a vacuum packaging bag, said apparatus comprising:

30 a single layer heat-extruder having a nozzle for melt extruding a heat-sealable resin suitable for forming said inner layer of said multi-layer film;

a cooling roll positioned with respect to said extruder nozzle such that said extruder applies said heat-sealable resin onto a circumferential surface of said cooling roll, said cooling roll formed having a pattern on said circumferential surface of said cooling roll which gives shape to said plurality of grooves on said inner layer, said cooling roll including steel;

5 a temperature controller for controlling a temperature of said cooling roll in order to properly effectuate cooling and formation of said heat-sealable resin into said grooved inner layer;

a laminating roll arranged to assist in holding said first material onto said cooling roll, said laminating roll having a diameter smaller than a diameter of said cooling roll; and

10 wherein said extruder, cooling roll, and laminating roll are arranged to accept an outer layer in conjunction with said extruded first material, such that said inner layer and said outer layer are laminated in between the cooling roll and the laminating roll to form said multi-layer film.

15 39. A multi-layer film suitable for use in forming a vacuum packaging bag, said multi-layer film comprising:

20 a patterned inner layer formed of a first material, said patterned inner layer having a plurality of grooves which operate to form channels suitable for evacuation of gas when said multi-layer film is used to form a vacuum packaging bag, said inner layer formed through heat extrusion of said first material onto a patterned cold roll, whereby said inner layer has a substantially uniform distribution of material, whereby said inner layer substantially lacks deformities typically present in an embossed film having a similar pattern formed by an embossing process; and

an outer layer laminated onto said patterned layer.

25 40. A multi-layer film as recited in claim 39, wherein said first material is a heat-sealable resin.

41. A multi-layer film as recited in claim 40, wherein said heat-sealable resin is a polyethylene resin.

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42. A multi-layer film as recited in claim 39, wherein said outer layer includes a gas impermeable layer.

43. A multi-layer film as recited in claim 39, wherein said pattern is a wave pattern.

44. A multi-layer film as recited in claim 39, wherein said pattern is a criss-cross pattern.

45. A multi-layer film as recited in claim 39, wherein said pattern is a straight-line pattern.

46. A multi-layer film as recited in claim 39, wherein said pattern is an uneven pattern.

47. A multi-layer film as recited in claim 39, wherein said pattern is a zigzag pattern.

48. A heat-sealable vacuum packaging bag for holding food or other product, said heat-sealable vacuum packaging bag comprising:

a first sheet formed of a multi-layer plastic film, said multi-layer plastic film including:

a patterned inner layer formed of a heat-sealable resin, said patterned inner layer having a plurality of grooves which operate to form channels suitable for evacuation of gas when said multi-layer film is used to form said vacuum packaging bag, said inner layer formed through heat extrusion of said first material onto a patterned cold roll, whereby said inner layer has a substantially uniform distribution of material substantially lacking deformities normally present in an embossed film having a pattern formed by an embossing process; and

an outer layer laminated onto said patterned inner layer, said outer layer including a gas impermeable material;

a second sheet formed of said multi-layer plastic film, said second sheet having a footprint substantially similar to said first sheet; and

said first and second sheets arranged with respective patterned inner layers facing one another, said first and second sheets heat-sealed on opposing lateral sides and at an end side,



whereby said first and second sheet form said vacuum packaging bag having an opening for insertion of food or other product, said vacuum packaging bag heat-sealable at said opening for insertion of food.

5           49.    A heat-sealable vacuum packaging bag for holding food or other product, said heat-sealable vacuum packaging bag comprising:

          a first sheet formed of a multi-layer plastic film, said multi-layer plastic film including:

          a patterned inner layer formed of a heat-sealable resin, said patterned inner layer having an opposing zigzag pattern operable to form varying width channels suitable for  
10          evacuation of gas when said multi-layer film is used to form said vacuum packaging bag, whereby said varying width channels tend to retard fluid flow during vacuum evacuation of said vacuum packaging bag; and

          an outer layer coupled to said patterned inner layer, said outer layer including a gas impermeable material;

15          a second sheet having a footprint substantially similar to said first sheet; and

          said first and second sheets arranged with said patterned inner layer internal to said heat-sealable vacuum packaging bag, said first and second sheets sealed on opposing lateral sides and at an end side,

          whereby said first and second sheet form said vacuum packaging bag having an opening  
20          for insertion of food or other product, said vacuum packaging bag heat-sealable at said opening for insertion of food.

25           50.    A vacuum packaging bag as recited in claim 49, wherein said second sheet is also patterned.

          51.    A vacuum packaging bag as recited in claim 49, wherein said first and second sheets are sealed via heat sealing.

30           52.    A vacuum packaging bag as recited in claim 49, wherein said first and second sheets are sealed via pressure sealing.

53. A heat-sealable vacuum packaging bag for holding food or other product, said heat-sealable vacuum packaging bag comprising:

a first sheet formed of a multi-layer plastic film, said multi-layer plastic film including:

5 a patterned inner layer formed of a heat-sealable resin, said patterned inner layer having a plurality of grooves which operate to form channels suitable for evacuation of gas when said multi-layer film is used to form said vacuum packaging bag, said inner layer formed through heat extrusion of said first material onto a patterned cold roll, whereby said inner layer has a substantially uniform distribution of material substantially lacking deformities normally present in  
10 an embossed film having a pattern formed by an embossing process; and

an outer layer laminated onto said patterned inner layer, said outer layer including a gas impermeable material;

a second sheet including a gas impermeable material, said second sheet having a footprint substantially similar to said first sheet, said second sheet having an unpatterned inner layer made  
15 of a heat-sealable resin; and

said first and second sheets arranged with respective inner layers facing one another, said first and second sheets heat-sealed on opposing lateral sides and at an end side,

whereby said first and second sheet form said vacuum packaging bag having an opening for insertion of food or other product, said vacuum packaging bag heat-sealable at said opening  
20 for insertion of food.

54. A bag roll suitable for forming heat-sealable vacuum packaging bags for holding food or other product, said bag roll comprising:

a first sheet formed of a multi-layer plastic film, said multi-layer plastic film including:

25 a patterned inner layer formed of a heat-sealable resin, said patterned inner layer having a plurality of grooves which operate to form channels suitable for evacuation of gas when said multi-layer film is used to form said vacuum packaging bag, said inner layer formed through heat extrusion of said first material onto a patterned cold roll, whereby said inner layer has a substantially uniform distribution of material substantially lacking deformities normally present in  
30 a film having a pattern formed by an embossing process; and

an outer layer laminated onto said patterned inner layer, said outer layer including a gas impermeable material;

a second sheet formed of said multi-layer plastic film and having a shape and size substantially similar to said first sheet; and

5        said first and second sheets arranged with respective patterned inner layers facing one another, said first and second sheets heat-sealed on opposing lateral sides,

whereby portions of said bag roll may be cut from said bag roll, thereby creating a partially formed bag having opposing open ends that are heat-sealable.

10    55.    A method for making a multi-layer vacuum packaging film comprising:

flowing a plastic melt, from a multi-layer extruder, onto a rotating roller; and

cooling said plastic melt while simultaneously imparting a pattern, via a pattern imparting means, onto said plastic melt resulting in said vacuum packaging film.

15    56.    A method for making a vacuum packaging film comprising:

flowing a plastic melt, from a multi-layer extruder, onto a rotating cooling roller; and

cooling said plastic melt, on said rotating cooling roller, into said vacuum packaging film.

57.    Said method as recited in claim 56 wherein said rotating cooling roller contains an  
20    inverse-pattern that imparts a pattern onto said vacuum packaging film.

58. A method for making vacuum packaging film comprising:  
  
flowing a plastic melt, from a multi-layer extruder, onto a cooling plank;  
  
cooling said plastic melt, as it flows over said cooling plank, into a vacuum packaging film.

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59. Said method as recited in claim 58 wherein said cooling plank contains an inverse-pattern that imparts a pattern onto said vacuum packaging film.

60. A method for making vacuum packaging film comprising:

10 flowing a plastic melt, from a multi-layer extruder, in said vicinity of an air-knife; and  
  
cooling said plastic melt, as it flows in said vicinity of said air-knife, into a vacuum packaging film.

61. A method as recited in claim 60 wherein said air-knife is an inverse-vacuum.

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62. A method as recited in claim 60 wherein said air-knife imparts a pattern onto said vacuum packaging film.

63. A method as recited in claim 61 wherein said inverse-vacuum imparts a pattern onto said  
20 vacuum packaging film.

64. A method as recited in claim 60 wherein said multi-layer extruder is a single layer extruder.

65. An apparatus for producing a vacuum packaging film comprising:

5 a multi-layer extruder for producing a plastic melt; and

a pattern imparting means for imprinting a pattern onto said plastic melt as it congeals into said vacuum packaging film.